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Migration and Exploitation of Greenland Halibut, Reinhardtius hippoglossoides (Walb.),
in the Nuuk Area, West Greenland Based on Tagging Experiments in 1969-70

by

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Abstract

In the years 1969 and 1970 a total of 1798 Greenland halibut were tagged with Petersen disc tags in Godthåb Fjord, NAFO Division 1 D. The fish were caught by long lines and trawl. From these experiments 308 recaptures were reported. The recaptures indicate that the stocks in the fiords are very stationary. Fish that were tagged from trawl catches were recaptured to a less degree than fish tagged from long lines catches. Therefore data on recaptures from trawl catches were omitted in the analysis, when estimating mortality rates. Z was estimated to be 0.76 and F was estimated to be 0.14 as a minimum.

Introduction

Greenland halibut is widely distributed in the West Greenland area. The fishery takes place in the fiords. The most important fishery is traditionally in NAFO Div 1A, but also in the Godthåb Fjord (NAFO Div 1D) a considerable fishery has taken place since the early sixties.

Tagging experiments with Greenland halibut in West Greenland waters from 1935 to 1964 have been reported by Smidt (1969). This paper presents the results of tagging experiments in the Godthåb Fjord area from 1969-70.

Material and Methods

In May 1969 and April-May 1970 a total of 1798 Greenland halibut caught by long lines, fish trawl and shrimp trawl were tagged in the Godthåb Fjord. Tagging was mainly in the inner part of the fiord (Fig. 1). All fish were tagged with Petersen - type discs.

Results

Of a total of 1504 fish tagged from long lines catches in 1969 and 1970, 20% (301) had been reported as recaptured by the end of 1977 (Table 1). As opposed to this, only 2% of the fish tagged from trawl catches were reported as being recaptured.

Length of fish tagged from the long lines ranges between 51 and 111 cm (total length) with the major part in the 60-90 cm interval. Fig. 2 shows the length

distribution of tagged fish that were recaptured, together with the length distribution of those that were not recaptured. There is no major difference between these two length distributions; only it seems that the length of fish, that were later recaptured, is slightly greater than the length of fish not recaptured.

Out of a total of 308 recaptures 303 were caught in the Godthåb Fjord. The location of recapture was not recorded for the remaining 5 recaptures.

In order to estimate the average total mortality (Z) in the period only data from the long-line experiments were used and the number of tags reported was standardized per 500 t annual landings (Table 1). Annual landings were taken from NAFO Statistical Bulletin with the assumption that catches by small greenland boats in Division 1D, mainly represent catches in the Godthåb Fjord (Table 2). Average total mortality was estimated by linear regression analysis method of weighted least squares as described by Farebrother (1985). Tagging experiments from the two years were pooled, and recaptures in the year of tagging were omitted. The results are :

$$Z = 0.76 \quad R^2 = 0.98 \quad 95\% \text{ C.I.} = 0.49 \text{ to } 1.03$$

A very rough estimate of average fishing mortality (F) can be calculated from the classic catch equation :

$$n_t = N \times (F/Z) \times (1 - \exp(-Z \times t))$$

where n_t is the number recaptured up to t years after tagging, and N is the initial number tagged. In this equation it is not possible to standardize by landings, although n_t is clearly influenced by the pattern of variation in fishing effort during the period. However, the calculation results in an average F of 0.14.

Discussion

Together with Jakobshavn and Umanak districts Godthåb Fjord is the most important area for the Greenland halibut fishery. Annual landings in the Godthåb Fjord range from 100 t to 1000 t in the period 1964-82.

The recapture rate for fish tagged from long line catches was higher than for fish tagged from trawl catches. This is probably due to a higher tagging mortality (including mortality due to the proces of catching and handling) of fish coming from trawl catches. Similar observations were made in tagging experiments with Greenland halibut in the Labrador-Newfoundland region (Bowering, 1984).

The great similarity between length distributions of recaptured and that of non-recaptured tagged fish shows, that all length groups of tagged fish had the same possibility of being recaptured.

All recaptures of known location were made in the Godthåb Fjord; this confirms the conclusion of earlier tagging experiments at West Greenland, namely that the stocks in the fjords are very stationary (Smidt 1969). These earlier experiments included 234 reported recaptures from a total of 2056 fish tagged at several localities. So far only one long-distance migration has been recorded: A fish tagged in Lichtenau Fjord, Southwest Greenland, in 1954 was recaptured off Vestfirðir, Iceland, in 1959. Smidt (l.c.) stated that Greenland halibut in the fjords and at other inshore localities in West Greenland emigrate to the Davis Strait for spawning. This spawning migration has never been confirmed by tagging experiments, though.

The estimated value of Z (Z=0.76) is of almost the same order as found by Smidt (l.c.) in a tagging experiment at Jakobshavn 1935-36. Likewise, the value of F (F=0.14) found in the present experiment is close to the results of the Jakobshavn experiment. In calculating F tagging mortality, failure of reporting and pattern of variation in fishing effort during the period must be taken into account. If the number of years (t) in the experiment is large, the equation shown before can be rewritten as :

$$n_t/N = F/Z$$

The value of F obtained by this method is less than the true F because of tagging mortality (N greater than true N) and non-reporting of recaptures (n_t smaller than true n_t). It is not possible to give an accurate measure of the tagging mortality and of the failure of reporting recaptures. Individual specimens of Greenland halibut caught by Greenlanders will pass through the hands of several persons. Because of this Horsted (1965) estimated the chances of a tag being discovered and consequently the rate of return of cod tags in the Greenland fishery to be close to 100%. This may be too optimistic and a value somewhat less than 100% seems more reasonable. The annual landings were at a minimum level in the first two years (1970,71) of the experiment. If, instead, fishing effort had been at a maximum level at the beginning of the experiment, the total number recaptured would likely have been greater, even though the average value of F was the same in the period. On the background of these considerations the calculated F-value of 0.14 must be a minimum estimate.

References

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Table 1. Tagging of Greenland halibut in the Nuuk area in 1969 and 1970

<u>Experiment</u>	<u>Year of recapture</u>	<u>Number recaptures</u>	<u>No. of recaptures per 500t landed</u>
long lines	0	8	12.5
May 1969	1	52	140.5
N = 1075	2	63	109.4
	3	44	35.8
	4	16	10.8
	5	10	7.6
	6	3	4.2
long lines	0	26	70.3
April-May 1970	1	41	71.2
N = 429	2	18	16.7
	3	10	6.7
	4	10	7.6
	5	2	2.8
	6	1	2.7
	7	1	0.9
shrimp trawl	0	1	2.7
May 1970	1	2	3.5
N = 261	2	1	0.7
fish trawl	0	-	-
April 1970	1	1	1.7
N = 33	2	-	-
	3	1	0.7
	4	1	0.8

Table 2. Annual landings in tons of Greenland halibut since 1964 by Greenlandic fisherman in NAFO Division 1D.

1964	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82
1006	413	458	134	206	319	185	288	614	742	660	360	184	573	600	537	713	711	810

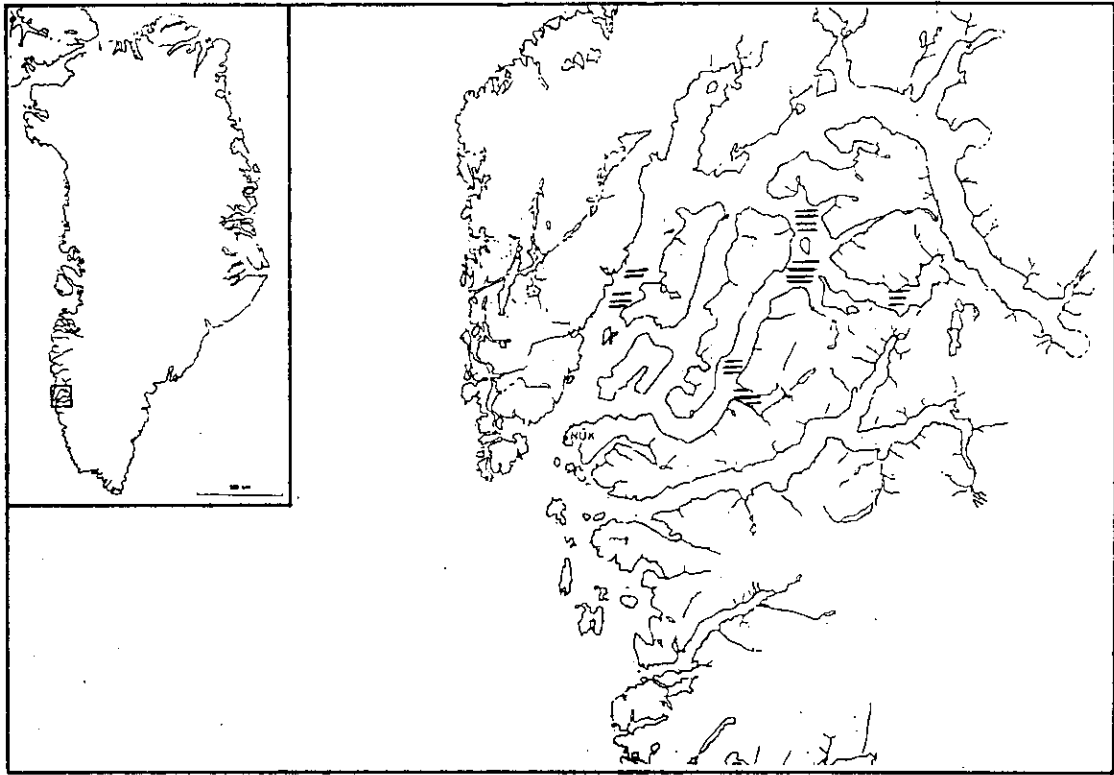


Fig. 1 : Map showing the tagging sites in the Godthåb Fjord.

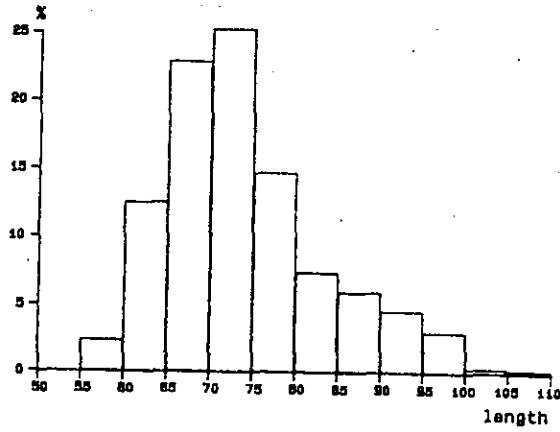
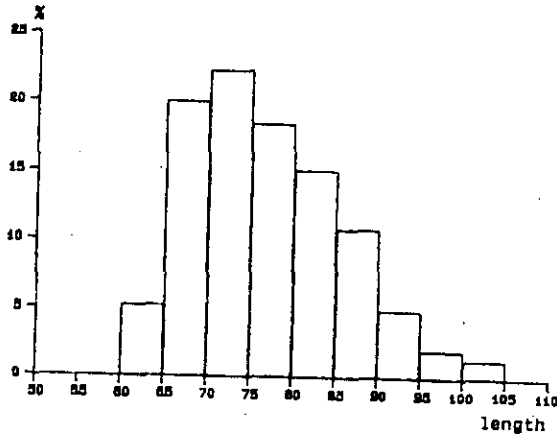


Fig. 2 : Length distribution at the time of tagging of fish that were subsequently recaptured (upper figure) and not recaptured (lower figure).